24(6)
SOV/57-28-10-4/40

AUTHORS: Mashovets, V. P., Korobov, M. A.

TITLE: Conditions for the Electrical Modeling of a Thermal Field With Internal Heat Sources (Usloviya elektricheskogo modelirovaniya teplovogo polya s vnutrennimi istochnikami tepla)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, Vol 28, Nr 10, pp 2124-2129 (USSR)

ABSTRACT: The method which has hitherto been used for the electrical modeling of thermal fields can only be applied to the Laplace (Laplas) field (which incorporates no internal heat sources). In practical engineering, however, cases are frequently found of systems with internal heat sources or sinks in the process medium. A practical example of this is the investigation of the temperature field in a furnace for electrode graphitization which was carried out by Volynskiy (Ref 4). Such furnaces often are operated with a control. Hence this paper is limited to such cases, and all quantities refer to unit time. The "critical" equation holding for the internal domain and for the boundary conditions of the electric field, which is the model for the temperature field with internal sources, is deduced. The model must satisfy the conditions (16) or (17) and, besides, the

Card 1/2

SOV/57-28-10-4/40

Conditions for the Electrical Modeling of a Thermal Field With Internal Heat Sources

respective boundary conditions of first, second, and third order must be given. The first order condition is furnished by the temperature $T_S$ on the surface S. The second order boundary condition makes use of equation (17) which holds within, and on the boundaries of the domain. The boundary conditions of third order are given by the conditions of convectional heat exchange. A practical example was afforded by the temperature field of a continuously burning self-consuming anode of the electrolyzer used in aluminum production. There are 6 references, 6 of which are Soviet.

SUBMITTED: July 16, 1958

Card 2/2

SOV/136-59-7-10/20

AUTHOR: Korobov, M.A.

TITLE: Corrosion of Anode Pins in Aluminium Electrolysis

PERIODICAL: Tsvetnyye metally, 1959, Nr 7, pp 52-59 (USSR)

ABSTRACT: Cokes produced in the refining of high-sulphur oils of the Bashkirskiya (Bashkiriye) and Yuzhno-Ural'skiye (South Ural) deposits are considerably cheaper for anode-paste production than are currently-used materials. The high and difficult-to-remove sulphur content of these cokes, which leads to quicker corrosion of anode pins, has proved an obstacle to their use, as has the expectation of increased contact resistance due to sulphide films. The author deals with these factors in the present article. P.S. Perminov and A.A. Putikov (Ref 1), working on steel corrosion under conditions similar to those prevailing in anodes, showed that alloy (1% Cr, Al and Mo) steels have a higher corrosion resistance than ordinary carbon steels. The author carried out corrosion tests, under laboratory and works conditions, on type KhYuA-35 and KhMYuA-38 steels with respective compositions: 0.30-0.40, 0.30-0.38%C, 0.3-0.6,

Card 1/3

SOV/136-59-7-10/20

Corrosion of Anode Pins in Aluminium Electrolysis

0.30-0.60% Mn; 0.17-0.37, 0.17-0.35% Si; 1.35-1.65, 1.35-1.65% Cr; 0.65-1.25, 0.75-1.25% Al; 0.40-0.60% Mo (Table 1). The anode paste was made from 2% S oil coke which was heated in a 250 x 600 x 900 mm iron box for 13-15 days, the temperature being raised at a constant rate by 50°C per day; the level of liquid paste was maintained constant. During the heating a direct current was passed through the test specimens, the voltage drop at the contact being determined. Fig 1 shows the apparatus and circuits: the corresponding contact resistances are shown in Table 2 together with those found by Yu. V. Baymakov and A.A. Berdennikov (Ref 3). The extent of corrosion was found from losses in weight and length and from the thickness of surface films. The pin carbon-anode contact resistance found (Fig 3) was less than previously supposed, and direct determinations were made at room temperature with film-specimens cut from pins used in production. Table 3 shows the chemical composition and resistivity of the films; film resistivity is not sufficient

Card 2/3

to affect anode resistance appreciably. The author recommends the use of alloy steels for pin ends. There are 2 figures, 4 tables and 3 Soviet references

ASSOCIATION: VAMI

S/080/60/033/04/19/045

AUTHOR: Korobov, M.A.

TITLE: The Simulation of the Heat Field of the Anode of an Aluminum Electrolyzer

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol 33, Nr 4, pp 861 - 865

TEXT: The heat field of the anode of an aluminum electrolyzer must be investigated in connection with the development of high-power baths with the current supply to the anode from above. The heat field has been previously investigated by measurement on an industrial electrolyzer and by mathematical calculation [Ref 1]. Mathematical simulation carried out on an EI-12 electrointegrator has been used here. The heat field in the central cross section of the anode is practically plane-parallel and is described by the equation:

$$\frac{\delta}{\delta x}\left[\lambda(t)\frac{\delta t}{\delta x}\right]+\frac{\delta}{\delta y}\left[\lambda(t)\frac{\delta t}{\delta y}\right]=-0.24\rho\delta^2,$$

The heat field is characterized by the following boundary conditions: 1) A condition of the first type corresponds to the lower surface of the anode due to the intensive circulation of the electrolyte. It is described by the equation $t = f(x, y)$. 2) The side surfaces of the anode transfer heat to the surrounding space according to the

Card 1/3

S/080/60/033/04/19/045

The Simulation of the Heat Field of the Anode of an Aluminum Electrolyzer

condition of the third type: $\lambda \frac{\delta t}{\delta n} = \alpha (t - t_0)$, where is the coefficient of heat transfer $\left(\frac{\text{cal}}{\text{cm}^2 \cdot \text{degree} \cdot \text{sec}}\right)$ which considers both the radiative and the convective heat exchange, $\alpha = \alpha_r + \alpha_c$; $t_0$ is the temperature in the space surrounding the anode. 3) The upper surface of the anode transfers heat to the surrounding space but the amount of heat is determined only by the design of the anode and technological conditions. This boundary corresponds to a condition of the second type: $\lambda \frac{\delta t}{\delta n} = f(x, y)$.

It has been shown that overheating of the anode must be avoided by selecting parameters which reduce the amount of heat developed in the center of the anode. **
There are: 3 graphs and 3 Soviet references.

Card 2/3

S/080/60/033/04/19/045

The Simulation of the Heat Field of the Anode of an Aluminum Electrolyzer

* where (t) is the heat conductivity of the anode ($\frac{\text{cal}}{\text{cm}\cdot\text{sec}\cdot\text{degree}}$) which is a function of the temperature t; $\rho$ is the specific resistance of the anode ($\Omega \cdot$cm); $\delta$ is the current density (A/cm$^2$).

** V.A. Yevtushenko took part in the work.

ASSOCIATION: Vsesoyuznyy alyuminiyevo-magniyevyy institut (VAMI) (All-Union Aluminum-Magnesium Institute)

SUBMITTED: September 1, 1959

Card 3/3



KOROBOV, M.A.

Method of calculating the optima parameters of a continuously self-baking anode in an aluminum electrolytic cell. TSvet. met 33 no. 12:33-38 D '60. (MIRA 13:12)

1. Vsesoyuznyy alyuminiyevo-magniyevyy institut.
(Aluminum--Electrometallurgy)

36864
S/170/62/005/005/013/015
B104/B102

24.5200

AUTHOR: Korobov, M. A.

TITLE: A graphical method of heat-field construction applied to calculations of heat transfer

PERIODICAL: Inzhenerno-fizicheskiy zhurnal, v. 5, no. 5, 1962, 105 - 107

TEXT: The surface temperature of a wall transferring heat is assumed to be constant. The so-called primary heat field is constructed by methods used in electrotechnics. By means of this field the heat flux through the wall is determined and from it the surface temperature is calculated and taken as the basis for recalculating the temperature field, heat flux and surface temperature. If the values obtained do not differ greatly from the values used to construct the secondary field all the required quantities can be determined from that field. In an example the temperature field in the corner of a furnace wall is constructed and the heat flux is calculated (Fig. 1). The temperature on the inner surface of the wall is 1000°C, the wall is 0.5 m thick and heat conductivity is 5 kcal/m·hour·deg. Air at a temperature of 0°C flows round the outer

Card 1/2





surface of the wall. In constructing the primary field the temperature of the outer surface is assumed to be 300°C. The isotherms and the heat-flow lines intersecting them orthogonally are drawn. The heat fluxes through the tubes are determined, and used to redetermine in a second approximation the temperatures of the outer surface. Results: the corner temperature is 81°C; at a distance of 2.5 m from the corner the temperature approaches 300°C. There are 2 figures.

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy alyuminiyevo-magniyevyy institut, g. Leningrad (All-Union Scientific Research Institute of Aluminum and Magnesium, Leningrad)

SUBMITTED: September 10, 1961

Card 2/3

KOROBOV, M.A.

Applying the theory of similarity to the determination of the dimensions of electrodes and of the current density in them. Zhur.prikl.khim. 35 no.5:1026-1029 My '62. (MIRA 15:5)

1. Vsesoyuznyy alyuminievo-magniyevyy institut.
(Electrodes) (Chemical models)

KOROBOV, M.A.

Applying the similitude theory for the calculation of current density in the design of aluminum electrolytic cells. TSvet. met. 35 no.6: 63-66 Je '62. (MIRA 15:6)
(Aluminum--Electrometallurgy) (Electric currents--Models)

KOROBOV, M.A.; TSYPLAKOV, A.M.; TIMCHENKO, B.I.

Thermal field of the cathode in an aluminum electrolytic cell. TSvet.met. 35 no.2:49-55 F '62. (MIRA 15:2)
(Aluminum—Electrometallurgy) (Heat—Transmission)

KOROBOV, M.A.

Application of the graphic method to the tracing of a thermal field in heat transfer calculations. Inzh.-fiz.zhur. no.5:105-107 My '62. (MIRA 15:7)

1. Vsesoyuznyy nauchno-issledovatel'skiy alyuminiyevo-magniyevyy institut, Leningrad.

(Heat—Transmission)
(Graphic methods)

S/057/62/032/012/002/017
B104/B186

AUTHOR: Korobov, M. A.

TITLE: The dependence of the form factor on the boundary conditions for some potential fields

PERIODICAL: Zhurnal tekhnicheskoy fiziki, v. 32, no. 12, 1962, 1413-1417

TEXT: The dependence of the form factor $\phi = \varkappa\varphi L/\Pi$ on the boundary conditions $\varkappa\partial\varphi/\partial n = \alpha(\varphi - \varphi_1)$ of the third kind for potential fields is investigated. Here $\varkappa$ is the conductivity (electrical and thermal conductivity etc.), $\varphi$ is the corresponding potential, e.m.f. or temperature, L the determining sample dimension, $\Pi$ the flow (electric current intensity, amount of heat per unit time, etc.), $\alpha$ the conductivity of the contact layer (reciprocal polarizability, reciprocal contact resistance, heat transfer coefficient, etc.). From these boundary conditions the criterion $Bi = \alpha L/\varkappa$ is derived, which is called Biot number in heat engineering and electrochemical similarity number in electrochemistry. With it the dependence of the form factor on the boundary conditions of the third kind can be represented in the form $\phi = f(Bi', Bi'')$ where Bi' and Bi" are the

Card 1/4

The dependence of the form factor... S/057/62/032/012/002/017
B104/B186

Biot numbers of the conductance and the transference boundaries. In Fig. 2 it is shown that the form factor, especially with small Biot numbers, depends substantially on these. With large Biot numbers the form factor approaches asymptotically a value $\phi_0$ which corresponds to the primary field, i.e. to a field with a potential that is constant on the boundaries AEB. (Fig. 1). If the Biot number approaches zero, the form factor tends towards a value $\phi_{j\infty}$ which corresponds to the Neumann boundary value problem with constant normal derivatives of the potential on the surfaces of the electrodes. This results in a redistribution of current densities and of field strengths, which in turn leads to a change of the form factor. The difference between $\phi_{\infty j}$ and $\phi_0$ depends, e.g., on the electrolytic cells and is the greater the more irregular the current of the electrodes on the edge of the cells. By diminishing the Biot number a uniform current distribution can be obtained in cells with irregular current distribution. There are 2 figures and 1 table.

Card 2/4

ASSOCIATION: Vsesoyuznyy nauchno-issledovatel'skiy alyuminiyevo magniyevyy institut, Leningrad (All-Union Scientific Research Institute of Aluminum and Magnesium, Leningrad)

SUBMITTED: December 3, 1961

Fig. 1. Scheme of the investigated cell of an aluminium electrolyzer

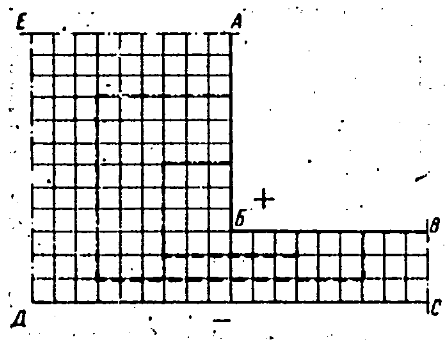




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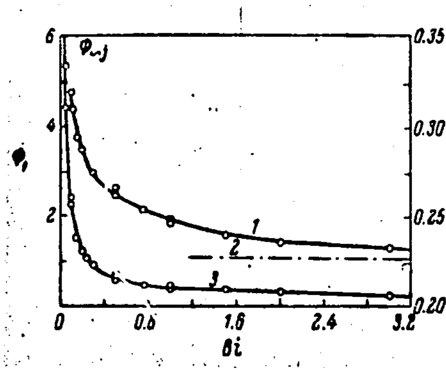
Fig. 2. Dependence of form factors on Biot numbers



KOROBOV, M.A.

Comparing heat loads of continuously self-baking anodes during the electrolytic production of aluminum. TSvet. met. 35 no.11:75-79 N '62. (MIRA 15:11)

(Aluminum—Electrometallurgy) (Electrodes)

KOROBOV, M.A.

The form factor as a function of boundary conditions for some potential fields. Zhur. tekh. fiz. 32 no.12:1413-1417 D '62. (MIRA 16:2)

1. Vsesoyuznyy nauchno-issledovatel'skiy alyuminiyevo magniyevyy institut, Leningrad.
(Potential, Theory of)
(Boundary value porblems)

KRIVORUCHENKO, Vladimir Vladimirovich[deceased]; KOROBOV, Mikhail Aleksandrovich; BELYAYEV, A.I., retsenzent; KALUZHSKIY, N.A., inzh., retsenzent; SHENKOV, V.V., inzh., retsenzent; OL'KHOV, I.I., insh., red.; EL'KIND, L.M., red. izd-va; ISLENT'YEVA, P.G., tekhn. red.

[Heat and power balance of aluminum and magnesium electrolyzers] Teplovye i energeticheskie balansy aliuminievykh i magnievykh elektrolizerov. Moskva, Metallurgizdat, 1963. 319 p. (MIRA 16:4)

1. Chlen-korrespondent Akademii nauk SSSR (for Belyayev).
(Electrometallurgy) (Heat—Transmission)

KOROBOV, M.A.

Loss of coke in the production of the anode mass and ways to reduce it. TSvet. met. 37 no.6:47-51 Je '64. (MIRA 17:9)

BESSHTANOV, A.I.; NYURENBERG, G.Ya.; DASHKIN, R.M.; KOROBOV, M.A.; KRAVTSOV, I.M.

Improving the performance of electrolytic cells as a result of an efficient poisitioning of auxiliary lifting mechanisms and anode pins. TSvet. met. 38 no.8:87-89 Ag '65. (MIRA 18:9)

ACC NR: AT7000565 SOURCE CODE: UR/2789/66/000/070/0003/0022

AUTHORS: German, A. I.; Korobov, M. G.; Markina, N. G.; Pakhomova L. A.

ORG: none

TITLE: The angular distribution of reflected radiation from flight data of an IL-18 aircraft in 1964

SOURCE: Tsentral'naya aerologicheskaya observatoriya. Trudy, no. 70, 1966. Radiatsionno-opticheskiye i ozonometricheskiye issledovaniya atmosfery (Radiation-optical and ozonometric investigations of the atmosphere), 3-22

TOPIC TAGS: aircraft, actinometry, aerial camera, solar radiation, radiation measurement, meteorologic satellite, cloud formation, potentiometer / AFA-37 aerial camera

ABSTRACT: This paper poses the problem of joint examination of cloud and radiation fields. A method for aircraft experiments and for processing the results of measurements of reflected short-wave radiation from various underlying surfaces and cloud formations is described. The aircraft had: actinometric apparatus for measuring the angular distribution of the intensity and flux density of reflected radiation (0.3—3.0 $\mu$); a Yanishevskiy pyranometer for measuring the total radiation flux; and an AFA-37 aerial camera for vertical photography of the terrain and cloud formations. The incident total radiation was recorded continuously on the paper tape of a

 UDC: 551.521.14

ACC NR: AT7000565

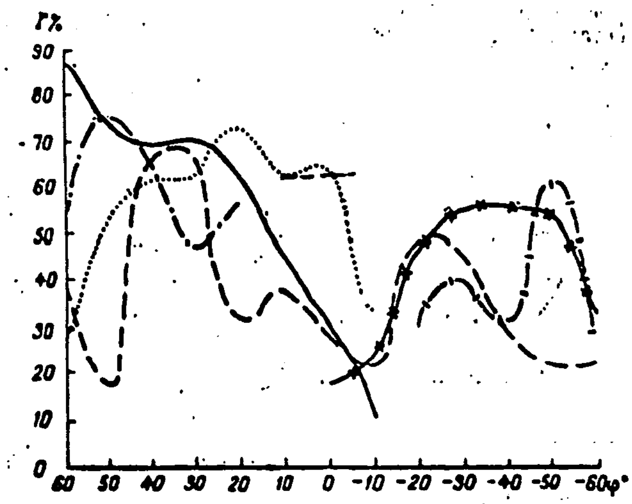



Fig. 1. Angular distribution of luminance coefficient above cumulus congestus

potentiometer. Flights were made in areas of Central Asia, the Caspian Sea, the European Territory of the SSSR, and the Far East. The ascending short-wave radiation was found to be chiefly determined by the reflecting properties of the underlying

Card 2/3

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ACC NR: AT7000565

surface and the clouds. The angular dependence of the luminance coefficient of the earth's surface and clouds within sighting angles of $0 \pm 60°$ is entirely determined by the horizontal heterogeneity of the reflecting properties of the earth's surface and the upper cloud limit (see Fig. 1). The contribution of the atmospheric layer above a water surface from the reference level to 9 km to the ascending radiation does not exceed 3% of the incident radiation for sighting angles of $0 \pm 30°$. Orig. art. has: 1 formula, 17 graphs, 3 photographs, and 4 tables.

SUB CODE: 04,20/SUBM DATE: 20Jan65/ ORIG REF: 004/ OTH REF: 005

Card 3/3

KOROBOV, M.G.; SHKLYAREVSKIY, V.G.

Study of the topography of the upper boundary of clouds by the stereophotogrammetric method. Trudy TSAO no.66:73-80 '65. (MIRA 19:1)

KOROBOV, M.N.

Lower Cambrian of the Kharaulakh Range. Izv. AN SSSR. Ser.geol. 28 no.4:35-51 Ap '63. (MIRA 16:6)

1. Geologicheskiy institut AN SSSR, Moskva.
(Kharaulakh Range--Geology, Stratigraphic)

KOROBOV, M.M.; RAYEV, Z.A.; MALETOV, I.F.; OVADIOVICH, I.Ya.

Operating procedure of innovator A.M.Prikhod'ko in the pneumatic malting unit. Spirt.prom.21 no.3:43-45 '55. (MIRA 8:12)

1. KTIPP. Kiyevskiy filial Vsesoyuznogo Nauchno-issledovatel'skogo instituta spirtovoy promyshlennosti. i Kiyevskiy spirtotrest.
(Malt)

KOROBOV, M.M.; NALETOV, I.F.; OVADIOVICH, I.Ya.; SYCH, P.K.

Use of a pneumatic-tube system at the trilesy Alcohol Plant. Spirt.prom.22 no.1:27-28 '56. (MLRA 9:7)

1.Kiyevskiy tekhnologicheskiy institut pishchevoy promyshlennosti imeni Mikoyana (for Korobov).2.Kiyevskiy spirtovyy trest (for Naletov, Ovadiovich).3.Trilesskiy spirtovyy zavod (for Sych).

(Pneumatic-tube transportation)

KOROBOV, M.M., dotsent, kand.tekhn.nauk; VOLYANSKIY, P.Ye., spetsred.; AKIMOVA, L.D., red.; KISINA, Ye.I., tekhn.red.

[Using pneumatic-tube transportation in the food industry] Opyt primeneniia pnevmaticheskogo transporta v pishchevoi promyshlennosti. Moskva, Pishchepromizdat, 1957. 37 p.

(MIRA 12:5)

(Food industry--Equipment and supplies)
(Pneumatic-tube transportation)

KOROBOV, M.M.; NIKOLAYCHUK, I.M.

Pneumatic installation for conveying distillers' dried solubles at the Petrovskiy Alcohol Plant. Spirt.prom. 23 no.8:22 '57.
(MIRA 11:1)

(Petrovskiy (Ivanovo Province)--Pneumatic-tube transportation)

KOROBOV, M.M.; NIKOLAYCHUK, I.M.

Operation of a pneumatic processing unit. Spirt. prom. 24 no.8:30 '58. (MIRA 11:12)

(Pneumatic-tube transportation)

KOROBOV, M.M.; NIKOLAYCHUK, I.M.; KONDAKOV, V.N.; ASAULENKO, I.A.

Study of the hydraulic transportation of barley. Izv.vys.ucheb.zav.; pishch.tekh. no.4:99-106 '60. (MIRA 13:11)

1. Kiyevskiy tekhnologicheskiy institut pishchevoy promyshlennosti. Kafedra tekhnologii brodil'nykh proizvodstv.
(Barley--Pipelines) (Hydraulics)

KOROBOV, M.M

Criterial dependence for determining the resistance of a layer of malt to an air flow. Izv. vys. ucheb. zav.; pishch. tekh. no.2: 143-146 '63. (MIRA 16:5)

1. Kiyevskiy tekhnologicheskiy institut pishchevoy promyshlennosti, kafedra tekhnologii brodil'nykh proizvodstv.
(Malt) (Air dynamics)

KOROBOV, Mark Moiseyevich, kand. tekhn. nauk; ROZOVSKIY, I.L., ~~doktor tekhn. nauk~~, retsenzent; DENISENKO, L.P., red. izd-va; BEREZOVYY, V.N., tekhn. red.

[Pneumatic and hydraulic conveying in the food industry] Pnevmo- i gidrotransport v pishchevoi promyshlennosti. 2., perer. i dop. izd. Kiev, Gostekhizdat USSR, 1963. 218 p. (MIRA 17:3)

KOROBOV, M. M.; Prinimali uchastiye: NIKOLAYCHUK, I. M.; KONDAKOV, V. M.; ASAULENKO, I. A.

Hydraulic conveying of distiller's grain in breweries. Spirt. prom. 28 no.8:18-19 '62. (MIRA 16:1)

1. Kiyevskiy tekhnologicheskiy institut pishchevoy promyshlennosti im. Mikoyana.

(Hydraulic conveying) (Breweries)

KAMINSKIY, M.I., dots.; KOROBOV, M.S.; STREBKOV, M.S.; VASNETSOVA, A.A.

Prospective complications in appendectomies and herniorrhaphies. Nov.khir.arkh. no.1:67-70 '62. (MIRA 15:8)

1. Kafedra organizatsii zdravookhraneniya, kafedra khirurgii Ukrainskogo instituta usovershenstvovaniya vrachey i 2-ya bol'nitsa g. Khar'kova.
(APPENDECTOMY) (HERNIA)

KOROBOVA, IU.

[illegible], Ye.; [illegible], N.

Universal types of storage for potatoes, vegetables and fruit. Sov. torg. 35 no.11:53-56 N '61. (MIRA 14:10)
(Farm produce--Storage)

KOROBOV, N.M. (poselok Burmakino)

Study of the state of health of the population of the Burmakino District. Sov. zdrav. 21 no.5:36-39 '62. (MIRA 15:5)
(BURMAKINO DISTRICT (YAROSLAVL PROVINCE)—STATISTICS, VITAL)

KOROBOV, M.N.

New trilobites from the Lower Cambrian of the Kharaulakh Range.
Paleont. zhur. no.4:64-75 '63. (MIRA 17:1)

1. Geologicheskiy institut AN SSSR.

KOROBOV, N. M.

"Functions with Uniform Distribution of Fractional Parts," Dokl. AN USSR, 62, No.1, 1948

KOROBOV, N. M.

**Korobov, N. M.** Some problems on the distribution of fractional parts. Uspehi Matem. Nauk (N.S.) 4, no. 1(29), 189-190 (1949). (Russian)

The following theorems are stated. (I) Let $f(x)=\sum_{\nu=0}^{\infty}a_\nu x^\nu$, where $|a_\nu|=e^{-\omega(\nu)}$. If, for every sufficiently large $\nu$, $\omega(\nu)>\nu^\lambda$ and $(1+\beta_1/\nu)\omega(\nu)\leqq\omega(\nu+1)\leqq\beta_2\nu\omega(\nu)$, where $\lambda>1$, $\beta_1>1$, $0<\beta_2<1$, then $f(x)$ is uniformly distributed. If a function $g(x)$ possesses the property that for every set of integers $m_1, \cdots, m_s$ not all zero the function

$$F(x)=m_1g(x+1)+\cdots+m_sg(x+s)$$

is uniformly distributed it is said to be completely uniformly distributed. The function $f(x)$ is such a function. (II) For every integer $q\geqq 2$ put $\alpha=\sum_{k=1}^{\infty}[\theta_k q]q^{-k}$, where $\theta_k=\{\varphi(k)\}$ is the fractional part of a completely uniformly distributed function $\varphi(k)$. Then $\alpha q^x$ is uniformly distributed. (III) Let $q_1, q_2, \cdots$ be a sequence of integers with $2\leqq q_1\leqq q_2\leqq\cdots$, $q_x\to\infty$ as $x\to\infty$, and put $f(k)=\alpha q_1q_2\cdots q_k$. Then a necessary and sufficient condition for $f(x)$ to be uniformly distributed is that $\alpha$ may be represented in the form $\alpha=\sum_{k=1}^{\infty}[\theta_k q_k]/(q_1q_2\cdots q_k)$, where $\theta_k=\{\varphi(k)\}$ is the fractional part of a uniformly distributed function $\varphi(k)$.

*R. A. Rankin* (Cambridge, England).

Source: Mathematical Reviews, Vol 11 No. 4

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000824810003-5"

KOROBOV, N. M.

USSR/Mathematics - Algebra Aug 49

"Sums of Fractional Lengths," N. M. Korobov, 2 pp

"Dok Ak Nauk SSSR" Vol LXVII, No 5

The problem of Khinchin and Ostrovskiy is generalized in the form $S(aq^x) - P/2 = o(P)$ (where S stands for summation 1 to P). Submitted by Acad I. M. Vinogradov 10 Jun 49.

66/49T42

Korobov, N. M.

Korobov, N. M. Normal periodic systems and a question on the sums of fractional parts. Uspehi Matem. Nauk (N.S.) 5, no. 3(37), 135–136 (1950). (Russian)

The author gives a brief indication of the proofs of the following results, the second of which depends on a result proved in the paper reviewed above. If $\epsilon(p)\to 0^+$ as $p\to\infty$, then there exists an $\alpha$ for which $\alpha q^x$ is uniformly distributed and such that $S(p)\neq o(p\epsilon(p))$, where

$$S(p)=\sum_{x=1}^{p}(\alpha q^x-[\alpha q^x])-\tfrac{1}{2}p;$$

thus, the error term $o(p)$, which is a consequence of the uniform distribution of $\alpha q^x$, cannot be improved for all $\alpha$. If $\phi(p)\to\infty$ as $p\to\infty$, then there exists an $\alpha$ for which $\alpha q^x$ is uniformly distributed and such that $S(p)=o(\phi(p))$.

*L. Schoenfeld* (Urbana, Ill.).

Source: Mathematical Reviews, Vol 12 No. 5

KOROBOV, N.M.

**Korobov, N. M.** Concerning some questions of uniform distribution. Izvestiya Akad. Nauk SSSR. Ser. Mat. 14, 215–238 (1950). (Russian)

If, for each choice of the positive integer $s$ and of the integers $m_1, \cdots, m_s$, not all 0, the function

$$m_1 f(x+1)+\cdots+m_s f(x+s)$$

is uniformly distributed, then $f(x)$ is said to be completely uniformly distributed. Polynomials are not completely uniformly distributed although some of them are uniformly distributed. Using estimates of exponential sums due to Vinogradov and his followers, the author establishes the existence of a class of completely uniformly distributed functions $f(x)$ such that for suitable positive $\lambda_1$ and $\lambda_2$, $f(x)=o(x^{\lambda_1 \log\log x})$, $f(x)\neq o(x^{\lambda_2 \log\log x})$. Now suppose that $b_k=\pm 1$, $\lambda>3$, $w(k)\geqq k^\lambda$, and $1+1/k\leqq w(k+1)/w(k)\leqq \frac{5}{4}$ for all sufficiently large $k$; using the previous result, the author shows that $f(x)=\sum_{k=0}^{\infty} b_k e^{-w(k)} x^k$ is uniformly distributed. By taking $b_k=1$ and $w(k)=k^{1+3/(\lambda-4)}$, the author shows that there is a function of this kind for which $f(x)>\exp\{(\log x)^{3/2-\epsilon}\}$.

The author next derives a necessary and sufficient condition on $\alpha$ for the function $\alpha q_1\cdots q_x$ to be uniformly distributed under the assumption that the $q_x$'s are integers greater than 1 and tend to infinity. He also obtains two sufficient conditions on $\alpha$ which insure the uniform distribution of $\alpha q^x$ if $q\geqq 2$. Taking $q_x=x+1$, it follows from the first of these results that $\alpha\cdot x!$ is uniformly distributed if $\alpha=\sum_{k=1}^{\infty}[k^{1+\lambda}]/k!$ and $0<\lambda<1$; other specializations of these results are also given. While the uniform distribution of these functions for almost all values of $\alpha$ (in the sense of measure 0) has been known since Weyl's work [Math. Ann. 77, 313–352 (1916)], not a single value of $\alpha$ has been known for which these functions actually are uniformly distributed.

*L. Schoenfeld* (Urbana, Ill.).

Source: Mathematical Reviews, Vol 12 No. 5

KOROBOV, N. M.

★**Korobov, N. M. Fractional parts of exponential functions.** Trudy Mat. Inst. Steklov., v. 38, pp. 87–96. Izdat. Akad. Nauk SSSR, Moscow, 1951. (Russian) 20 rubles.

Let $\varphi(x)$ be any completely uniformly distributed function, in the sense of the author's earlier paper [Uspehi Matem. Nauk 4, no. 1 (29), 189–190 (1949); these Rev. 11, 231], for which the system of functions $\varphi(x+1), \varphi(x+2), \cdots, \varphi(x+s)$ retains the property of uniform distribution under any linear transformation $x=\lambda y$. Define $\alpha_\nu$ $(\nu=1, 2, \cdots, n)$ by

$$\alpha_\nu = \sum_{k=1}^{\infty} [q_\nu\{\varphi(kn+\nu)\}]/q_\nu^k,$$

where the $q_\nu$ are any given integers greater than unity. Then the author proves that the function $F(x)=\alpha_1 q_1^x+\cdots+\alpha_n q_n^x$ is uniformly distributed. It is also proved that the function $\alpha f(x) a^x$ is uniformly distributed when $a$ is an integer greater than unity, $f(x)$ a polynomial of positive degree with integral coefficients and $\alpha$ is defined as a rapidly converging power series in $1/a$ with coefficients of a special form. Finally, the author considers the exponential sum $S=\sum_{x=1}^{P} e^{2\pi i \alpha q^x}$, where $q$ is an integer greater than unity and $0<\alpha<1$. Since $\int_0^1 |S|^2 d\alpha = P$, it follows that, corresponding to every $\epsilon>0$, we can find a sufficiently large $C=C(\epsilon)$ such that $|S|<C\sqrt{P}$ for every $\alpha$ in $(0, 1)$ except possibly for a set of measure less than $\epsilon$. By means of his theory of normal periodic systems [Izvestiya Akad. Nauk SSSR. Ser. Mat. 15, 17–46 (1951); these Rev. 13, 213] the author constructs a wide class of numbers $\alpha$ for which the inequality $|S|<(4\pi+1)q\sqrt{P}$ holds.

*R. A. Rankin* (Birmingham).

So: MATHEMATICAL REVIEW (Unclassified)
Vol XIV No 2, Feb 1953 pp 121-232

KOROBOV N. M.,

USSR/Mathematics - Academy of Sciences Jan/Feb 51

"Normal Periodic Systems and Their Applications to the Evaluation of Sums of Continuous Fractions," N. M. Korobov

"Iz Ak Nauk SSSR, Ser Matemat" Vol XV, No 1, pp 17-46

Korobov studies structure of normal periodic (recurring) systems and derives general method for construction of each such system. He thus finds sums of "fractional members" (Kettenbrueche,

170T52

USSR/Mathematics - Academy of Sciences (Contd) Jan/Feb 51

dyadic fractions, continuous fractions, recurring decimals) for index function $a \cdot q^x$. Submitted by Acad I. M. Vinogradov 13 Apr 50.

PA 170T52

170T52

KOROBOV, N. M.

2

Mathematical Reviews
Vol. 14 No. 11
December, 1953
Number Theory.

**Korobov, N. M.** On a question of diophantine inequalities. Comptes Rendus du Premier Congrès des Mathématiciens Hongrois, 27 Août–2 Septembre 1950, pp. 259–262. Akadémiai Kiadó, Budapest, 1952. (Russian. Hungarian summary)

After a brief historical account of some problems on uniform distribution the author proves the following result. If, for some function $\varphi(x)$ and arbitrarily chosen integers $m_1, m_2, \cdots, m_s$, not all zero,

$$m_1\varphi(x+1)+m_2\varphi(x+2)+\cdots+m_s\varphi(x+s)$$

is uniformly distributed, then $\alpha q^x$ is uniformly distributed, where $q$ is an integer greater than unity and

$$\alpha=\sum_{k=1}^{\infty}[\{\varphi(k)\}q]/q^k.$$

This is actually a particular case of earlier results due to the author [Uspehi Matem. Nauk (N.S.) 4, no. 1(29), 189–190 (1949); Izvestiya Akad. Nauk SSSR. Ser. Mat. 14, 215–238 (1950); these Rev. 11, 231; 12, 321]. A general theorem giving sufficient conditions for a function $\varphi(x)$ to possess the above property is stated (see references quoted).

*R. A. Rankin* (Birmingham).

KOROBOV, N.M.

USSR/Mathematics - Combinatorials, Index (Base) May/Jun 52

"Normal Periodic (Recurring) Systems," N. M. Korobov, Math Inst imeni Steklov, Acad Sci USSR

"Iz Ak Nauk, Ser Matemat" Vol XVI, No 3, pp 211-216

Derives the necessary and sufficient conditions for which one can construct normal periodic (recurring) systems in an arbitrary set of n-digit (n-place) numbers. Submitted by Acad I. M. Vinogradov. Received 13 Feb 52.

217T65

KOROBOV, N. M.

**Korobov, N. M. Some many dimensional problems of the theory of Diophantine approximations.** Doklady Akad. Nauk SSSR (N.S.) **84**, 13–16 (1952). (Russian)

In this paper the author constructs, with the aid of his theory of normal periodic systems, $s$ real numbers $\alpha_1, \alpha_2, \cdots, \alpha_s$ such that the function $(m_1\alpha_1+m_2\alpha_2+\cdots+m_s\alpha_s)q^x$ is uniformly distributed; i.e., the system of functions $\alpha_1 q^x, \cdots, \alpha_s q^x$ is uniformly distributed in $s$-dimensional space. Here $q$ is an integer greater than unity and $m_1, m_2, \cdots, m_s$ are integers not all zero. Two further theorems concerning systems of functions uniformly distributed in $s$-dimensional space, which are analogous to the first two results mentioned in the second preceding review, are given; it is stated that they may be proved by similar methods. *R. A. Rankin.*

Sov: MATHEMATICAL REVIEW (Unclassified)
Vol XIV No 2, Feb 1953 pp 121-232

KOROBOV, N. M.

231T68

USSR/Mathematics - Theory of Numbers, Probability — 11 May 52

"Certain Generalizations Concerning Uniform Distributions of Fractions," N. M. Korobov, A. G. Postnikov

"Dok Ak Nauk SSSR" Vol 84, No 2, pp 217-220

Demonstrates that the uniformity of distribution of certain of its subsequences follow, under familiar conditions, from the uniformity of distribution of the fractions of the sequence. Demonstrates the theorem: if for any integer h

231T68

the difference function $\Delta F(x) = F(x+h) - F(x)$ is uniformly distributed, then for each pair of integers L and M the function $F(Lx+M)$ is also uniformly distributed. Submitted by Acad I. M. Vinogradov 11 Mar 52.

231T68

KOROBOV, N. M.

USSR/Mathematics - Number Theory Sep/Oct 53

"Polymeric Problems of the Distribution of Fractions," N. M. Korobov, Math Inst im Steklov, Acad Sci USSR

Iz Ak Nauk SSSR, Ser Mat, Vol 17, No 5, pp 389-400

Expounds a new and unique method that permits one to solve a number of problems on the distribution of fractions of indicial functions and of the products of indicial functions into polynomials. Received 28 Jan 53.

274T67

KOROBOV, N. M.

Mathematical Reviews
Vol. 14 No. 9
October 1953
Number Theory

**Korobov, N. M.** The distribution of non-residues and of primitive roots in recurrence series. Doklady Akad. Nauk SSSR (N.S.) 88, 603–606 (1953). (Russian)

Suppose that, for all positive integers $x$, $\psi(x)$ satisfies the recurrence relation

$$\psi(x)=a_1\psi(x-1)+a_2\psi(x-2)+\cdots+a_n\psi(x-n)$$

for $x>n$, where $a_1, a_2, \cdots, a_n$ are fixed integers and $a_n\neq 0$; also let $\psi(1), \psi(2), \cdots, \psi(n)$ be integers not all zero. Let $p$ be a prime greater than $n$. Then $\psi(x)$ is called a recurrence function of order $n$ modulo $p$ if $a_n$ and at least one of the integers $\psi(i)$ $(1\leqq i\leqq n)$ is not divisible by $p$. The sequence $\delta_1, \delta_2, \delta_3, \cdots$ whose $m$th member $\delta_m$ is the least non-negative residue of $\psi(m)$ modulo $p$ is called a recurrence series of order $n$. Recurrence series of order $n$ are necessarily periodic and the least period of such a series is denoted by $\tau$, so that $1\leqq\tau\leqq p^{n-1}$. Write $S(N)=\sum_{x=1}^{N}e^{2\pi i\psi(x)/p}$, for $N\leqq\tau$. It is proved that $|S(\tau)|\leqq p^{\frac{1}{2}n}$, $|S(N)|\leqq p^{\frac{1}{2}n}(1+n\log p)$. A number of other theorems concerning the distribution of $m$th power residues and non-residues and of primitive roots in recurrence series is stated without proof. Thus Theorem 5 states that, for any $\epsilon>0$, there exists a $c=c(\epsilon, n)$ such that, for every recurrence series of order $n$ and period $\tau>\tau_0=cp^{\frac{1}{2}(n+1)+\epsilon}$, there occurs a primitive root modulo $p$ among every $N=[\tau_0]+1$ consecutive numbers of the series.

*R. A. Rankin* (Birmingham).

KOROBOV, N.M.

Mathematical Reviews
Vol. 14 No. 9
October 1953
Number Theory

x Chebyshev

Korobov, N. M. On some problems of Čebyšev type. Doklady Akad. Nauk SSSR (N.S.) 89, 397-400 (1953). (Russian)

It is known that, for given irrational $\alpha$, the inequalities

$$0<x<ct, \quad |\alpha x-y-\beta|<\frac{1}{t} \quad (c=c(\alpha)),$$

have solutions in integers $x$ and $y$ for arbitrary real $\beta$ and any $t\geqq 1$ if and only if the partial quotients of the continued fractions for $\alpha$ are bounded. The author proves the following analogous theorem, where $\alpha x$ is replaced by $\alpha q^x$, $q$ being a fixed integer greater than unity. Theorem: In order that there shall exist a number $C>0$ such that for arbitrary $\beta$ and $t\geqq 1$ a pair of integers $x$, $y$ can be found to satisfy

$$0\leqq x<Ct, \quad |\alpha q^x-y-\beta|<\frac{1}{t}$$

it is necessary and sufficient that $\alpha$ shall be of bounded ratio. These last two words are defined as follows. Let $\delta_n$ be the $n$th digit after the decimal point in the "decimal" expansion of $\alpha$ in the scale of $q$. Then $\lambda=\lambda(n)$ is defined to be the least positive integer with the property that among the first $\lambda$ $n$-digited numbers $\delta_{x+1}\delta_{x+2}\cdots\delta_{x+n}$ $(x=0, 1, \cdots, \lambda-1)$ that can be chosen from the decimal expansion of $\alpha$ each of the $q^n$ possible $n$-digited numbers occurs at least once. It is supposed that the fractional parts of $\alpha q^x$ are everywhere dense over the interval $(0, 1)$. Then $\alpha$ is said to be of bounded ratio if there exists a constant $c_1=c_1(\alpha)$ such that $\lambda(n)/q^n<c_1$ for all $n\geqq 1$. By means of his theory of normal periodic systems the author proves that numbers of bounded ratio do exist and shows how an infinity of them can be constructed. Generalisations of these results to $s$ dimensions are stated without proof. R. A. Rankin [illegible]

KOROBOV, N. M.

2

Korobov, N. M. Numbers with bounded quotient and their applications to questions of Diophantine approximation. Izv. Akad. Nauk SSSR. Ser. Mat. 19 (1955), 361–380. (Russian)

1 - F/W

Let $q$ be an arbitrary integer greater than unity, and let

$$\alpha = 0 \cdot \delta_1 \delta_2 \delta_3 \cdots$$

be the 'decimal' expansion of a real number $\alpha$ in the scale of $q$. Suppose that, for each $n \geqq 1$, there exists an integer $\lambda = \lambda(n)$ such that among the $n$-figure numbers

$$\delta_1 \delta_2 \cdots \delta_n, \ \delta_2 \delta_3 \cdots \delta_{n+1}, \ \cdots, \ \delta_\lambda \delta_{\lambda+1} \cdots \delta_{\lambda+n-1}$$

each of the $q^n$ different $n$-figure numbers occurs at least once. If there exists a number $C_1 = C_1(\alpha)$ such that, for all $n \geqq 1$, $\lambda(n)/q^n < C_1$, the number $\alpha$ is said to be a number with bounded ratio. In the theory of the distribution of the fractional parts of the numbers $\alpha q^x$ ($x = 1, 2, \cdots$), such numbers play a role similar to that played by numbers with bounded partial quotients in the theory of Diophantine approximation. Numbers $\alpha$ of the latter kind have the property that for them, and only for them, does there exist a constant $C = C(\alpha)$ such that the inequalities

$$0 < x < Ct, \quad |\alpha x - y - \beta| < t,$$

possess integer solutions in $x$ only for arbitrary $\beta$ and $t \geqq 1$.

1/2

The author shows that a necessary and sufficient condition for the existence of a number $C>0$ such that for arbitrary $\beta$ and $t\geqq 1$ there exist integers $x$ and $y$ satisfying the inequalities

$$0\leqq x<Ct,\ |\alpha q^x-y-\beta|<1/t,$$

is that $\alpha$ is a number of bounded ratio, and he constructs an infinite class of numbers of bounded ratio. He also constructs an infinite class of numbers $\alpha$ for which

$$|\alpha q^x-y-\beta|<(1+\varepsilon)/x$$

has infinitely many solutions in $x$, $y$ for each $\beta$, where $\varepsilon$ is an arbitrary positive number. Some of these results were already proved in an earlier paper of the author [Dokl. Akad. Nauk SSSR (N.S.) 89 (1953), 397–400; MR 14, 852] where the generalisations now mentioned were stated without proof.

The concept of bounded ratio is extended to systems of $s$ numbers $\alpha_i$ expressed in scales of bases $q_i$ ($i=1, \cdots, s$) and similar results are proved. These are applied to questions concerning the distribution of fractional parts, numbers $\alpha_1, \alpha_2, \cdots, \alpha_s$ being constructed such that the system of functions $\alpha_i q_i^x$ ($x=1, 2, \cdots$) are uniformly distributed in $s$-dimensional space. It is also shown that the number $N(v)$ of such points lying in a region $v$ of the $s$-dimensional cube, for $x\leqq P$, satisfies

$$N(v)=vP+O(P^{1-1/(s+1)}).$$

*R. A. Rankin* (Glasgow).

2/2

KOROBOV, N.M.

1/2

~~Korobov, N. M.~~ On completely uniform distribution and conjunctly normal numbers. Izv. Akad. Nauk SSSR [illegible] 20 [illegible]

[illegible]

$$\alpha(x) = \sum_{\nu=1}^{\infty} [illegible]$$

where $\{p_\nu\}$ is a strictly increasing sequence of [illegible] It is proved that the fractional parts of the function $\varphi(x) =$ [illegible] that

$$\sum_{x=1}^{P} e^{2\pi i \varphi(x)} = O(P^{\frac{1}{2}} \log P),$$

$$\sum_{x=1}^{P} e^{2\pi i F_s(x)} = O(P^{\frac{1}{2}} \log P,$$

where

$$F_s(x) = m_1\varphi(x+1) + m_2\varphi(x+2) + \cdots + m_s\varphi(x+s)$$

and $m_1, m_2, \ldots, m_s$ are arbitrary integers [illegible] These theorems extend [illegible]

Korobov, N.M.

2/2

3

author [Izv. Akad. Nauk SSSR. Ser. Mat. 14 (1950), 215–236, MR 12, 321].

It is also proved that if $\varphi(x)$ is any completely uniformly distributed function, and $q_1, q_2, \cdots, q_s$ are integers greater than unity, and $\alpha_1, \alpha_2, \cdots, \alpha_s$ are defined by

$$\alpha_\nu = \sum_{k=1}^{\infty} \frac{[\{\varphi(sk+\nu)\} q_\nu]}{q_\nu^k} \quad (1 \leq \nu \leq s)$$

then the system of functions $\alpha_1 q_1^x, \cdots, \alpha_s q_s^x$ is uniformly distributed in $s$-dimensional space. Here brackets $[\cdots]$ and $\{\cdots\}$ denote integral and fractional parts respectively. This result was stated [illegible]

14, 144].

R. A. Rankin (Glasgow).

Sm

KOROBOV, N.M. (Moscow)

Third All-Union Mathematical Conference. Mat. pros. no.1:177-178
'57. (MIRA 11:7)

(Mathematics--Congresses)

KOROBOV, N. M.

AUTHOR: KOROBOV, N.M. 20-6-3/48

TITLE: Approximate Computation of the Multiple Integrals With the Aid of Numbertheoretical Methods (Priblizhennoye vychisleniye kratnykh integralov s pomoshch'yu metodov Teorii chisel)

PERIODICAL: Doklady Akad.Nauk SSSR, 1957, Vol.115, Nr.6, pp.1062-1065 (USSR)

ABSTRACT: Let $f(x_1,\dots,x_s)$ be periodic with the period 1 in every variable and in the s-dimensional cube let it be developable into an absolutely convergent Fourier series:

$$f(x_1,\dots,x_s) = \sum_{m_1,\dots,m_s=-\infty}^{\infty} C(m_1,\dots,m_s)\exp\left[2\pi i(m_1x_1+\dots+m_sx_s)\right].$$

Let $\sigma = \sum_{m_i=-\infty}^{\infty} |C(m_1,\dots,m_s)|$. Let $\{A\}$ denote the non-integral part of the number A.

Theorem: Let $p > s$ be a prime number, $\xi_\nu(k) = \left\{\frac{k}{p^2}\right\}$ ($\nu=1,2,\dots,s$). In the s-dimensional unit cube let $\frac{\partial^{2s} f(x_1,\dots,x_s)}{\partial x_1^2\dots\partial x_s^2}$ be continuous and

CARD 1/3

Approximate Computation of the Multiple Integrals With the Aid of Numbertheoretical Methods 20-6-3/48



$\frac{\partial^{2r} f(x_1,\dots,x_s)}{\partial x_{j1}^2\dots\partial x_{jr}^2}$ for arbitrary integral $j_1 < j_2 < \dots < j_r$ ($1 \leqslant r \leqslant s$, $1 \leqslant j_1$, $j_r \leqslant s$) be bounded by a common constant C. Then for $N = p^2$ there holds the estimation

$$\left|\int_0^1\dots\int_0^1 f(x_1,\dots,x_s)dx_1\dots dx_s - \frac{1}{N}\sum_{k=1}^{N} f\left[\xi_1(k),\dots\xi_s(k)\right]\right| \leqslant \frac{(s-1)\sigma}{\sqrt{N}} + \frac{sC}{10N}.$$

Theorem: If there exist constants $C_1$ and $\varepsilon$ ($0 < \varepsilon < 1$) such that the condition

$$|C(m_1,\dots,m_s)| \leqslant \frac{C_1}{\left[(|m_1| + \delta_{m_1})\dots(|m_s| + \delta_{m_s})\right]^{1+\varepsilon}}$$

is satisfied, where $\delta_{m_\nu} = 1$ for $m_\nu = 0$ and $\delta_{m_\nu} = 0$ for $m_\nu \neq 0$,

CARD 2/3

AUTHOR: Korobov, N.M. SOV/42-13-4-6/11

TITLE: Estimations of Trigonometric Sums and Their Applications (Otsenki trigonometricheskikh summ i ikh prilozheniya)

PERIODICAL: Uspekhi matematicheskikh nauk, 1958, Vol 13, Nr 4, pp 185-192 (USSR)

ABSTRACT: The present paper is a continuation and improvement of earlier publications of the author [Ref 1,2,3] and overlaps partially with the announced results of Vinogradov.

Theorem: Let $f(x) = \alpha_1 x + \dots + \alpha_{n+1} x^{n+1}$ and let a part of the coefficients be rational: $\alpha_\nu = \frac{a_\nu}{q}$ ($\nu = s+2, s+3, \dots, 3s$; $1 \le s \le \frac{n+1}{3}$).

Let $\Delta_s$ denote the determinant of s-th order $\left| C^i_{s+i+j} a_{s+i+j} \right|$. Let $\delta$, $0 < \delta \le \frac{1}{3}$, be a fixed number, $n\delta \le s \le \frac{n+1}{3}$, $s+1 \le r \le 2s(1-\delta)$, $q = P^r$, $(\Delta_s, q) = 1$. Then there exist constants $C = C(\delta)$, $\gamma = \gamma(\delta)$ so that $\left| \sum_{x=1}^{P} e^{2\pi i f(x)} \right| < CP^{1-\frac{\gamma}{n^2}}$.

Theorem: For $|t| \to \infty$ it holds: $\zeta(1+it) = O(\ln^{\frac{2}{3}} |t|)$.
The proofs are based on six lemmas.

Card 1/2

Estimations of Trigonometric Sums and Their Applications SOV/42-13-4-6/11

There are 9 references, 6 of which are Soviet, 1 American, and 2 English.

SUBMITTED: April 11, 1958

Card 2/2



AUTHOR: Korobov, N.M. 20-118-2-6/60

TITLE: On the Estimation of Rational Trigonometric Sums (Ob otsenke ratsional'nykh trigonometricheskikh summ)

PERIODICAL: Doklady Akademii Nauk SSSR, 1958, Vol 118, Nr 2, pp 231-232 (USSR)

ABSTRACT: Let $S$ denote the sum

$$S = \sum_{x=1}^{P} e^{2\pi i \frac{a_1 x + \dots + a_{n+1} x^{n+1}}{q}}$$

where $q$, $a_i$ are integer and $(q, a_{n+1}) = 1$. Furthermore let be $1 \leqslant n < p_1 - 1$ where $p_1$ is the smallest prime divisor of $q$.

Theorem: There exist absolute constants $C$ and $\alpha$ so that on the interval $1 < r < n+1$ for $P = q^{1/r}$ it holds the estimation

$$|S| < C P^{1 - \frac{\alpha r(n+1-r)}{n^4 l^2}} \qquad \text{with } l = \ln \frac{2n}{n+1-r} .$$

Theorem: For each fixed $\varepsilon > 0$ it holds on $\varepsilon n < r < n$

Card 1/3

Estimations of Weyl Sums and Distribution of Prime Numbers SOV/20-123-1-6/56

of the Riemannian $\zeta$-function, already published by I.M. Vinogradov in [Ref 7].
There are 9 references, 8 of which are Soviet, and 1 American.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova AN SSSR (Mathematical Institute imeni V.A.Steklov, AS USSR)

PRESENTED: May 17, 1958, by I.M.Vinogradov, Academician

SUBMITTED: May 5, 1958

Card 2/2

69002

S/055/59/000/04/002/026

~~16(1)~~ 16.2600 16.1000

AUTHOR: Korobov, N.M.

TITLE: Calculation of Multiple Integrals With the Method of Optimal Coefficients

PERIODICAL: Vestnik Moskovskogo universiteta. Seriya matematiki, mekhaniki, astronomii, fiziki, khimii, 1959, Nr 4, pp 19-25 (USSR)

ABSTRACT: Let $s \geqslant 1$, $p > s$, $a_\nu = a_\nu(p)$ - integral, $\alpha \geqslant 1$, $C = C(\alpha, s) > 0$, $\beta = \beta(\alpha, s)$ - real, $\{x\}$ - the fractional part of $x$. For all functions $f(x_1, \ldots, x_s)$ of a certain class $E_s(\alpha)$ let for $N = p$ the estimation

$$(1) \quad \left| \int_0^1 \cdots \int_0^1 f(x_1, \ldots, x_s) dx_1 \ldots dx_s - \frac{1}{N} \sum_{k=1}^{N} f\left(\left\{\frac{ka_1}{p}\right\}, \ldots, \left\{\frac{ka_s}{p}\right\}\right) \right| \leqslant$$

$$\leqslant CN^{-\alpha} \ln^{\beta} N$$

be satisfied for an infinite sequence of the values N. It is said that (1) does not admit an essential improvement if in it the $\alpha$ cannot be replaced by an $\alpha' > \alpha$ for an arbitrary choice of the $a_1, \ldots, a_s$, for arbitrary functions of the class $E_s(\alpha)$,

Card 1/3



69002

S/055/59/000/04/002/026

Calculation of Multiple Integrals With the Method of Optimal Coefficients

and for an N which runs through the same sequence. In this case the integers $a_1, \ldots, a_s$ are called optimal coefficients. For a special class $E_s(\alpha)$ the determination of the optimal coefficients was carried out by the author [Ref 1]. In the present paper the author considers a more general class of functions which is defined as follows: Let $\psi(m) \geqslant |m|$ be an even function, let the series of its reciprocal values converge, $\psi(0) = 1$, $\frac{\psi(m)}{m}$ for $m > 0$ monotonely and $\psi(m) = O(|m|^{1+\varepsilon})$ for every $\varepsilon > 0$; then let the class $E'_s(\alpha)$ for $\alpha \geqslant 1$ be defined by

$$(4) \begin{cases} f(x_1, \ldots, x_s) = \sum\limits_{m_1, \ldots, m_s = -\infty}^{\infty} C(m_1, \ldots, m_s) e^{2\pi i(m_1 x_1 + \ldots + m_s x_s)} \\ |C(m_1, \ldots, m_s)| \leqslant \dfrac{C_1}{[\psi(m_1) \ldots \psi(m_s)]^{\alpha}}, \quad C_1 = \text{const.} \end{cases}$$

Card 2/3

16(1) SOV/20-124-6-7/55

AUTHOR: Korobov, N.M.

TITLE: On Approximative Calculation of Multiple Integrals (O priblizhennom vychislenii kratnykh integralov)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 124, Nr 6, pp 1207-1210 (USSR)

ABSTRACT: Let $p > 3$ be a prime number; $n \geqslant 1$ integer; $z_1, \ldots, z_n$ integers from the interval $1 \leqslant z \leqslant p-1$; $\left\{\frac{kz_\nu}{p}\right\}$ the fractional part of $\frac{kz_\nu}{p}$. Let

$$H(z_1, \ldots, z_n) = \sum_{k=1}^{p-1} \left[1-2\ln\left(2\sin\pi\left\{\frac{kz_1}{p}\right\}\right)\right] \ldots \left[1-2\ln\left(2\sin\pi\left\{\frac{kz_n}{p}\right\}\right)\right].$$

The integers $a_1, a_2, \ldots$ are denoted as optimum coefficients, if $1 \leqslant a_1 \leqslant p-1$ and if for given $a_1, \ldots, a_\nu$ $(\nu \geqslant 1)$ the number $a_{\nu+1}$ is equal to one of those z-values $(1 \leqslant z \leqslant p-1)$ for which $H(z_1, \ldots, z_n)$ attains a minimum. Let the function $f(x_1, \ldots, x_s)$

Card 1/3

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000824810003-5



be defined in the s-dimensional cube by the absolutely convergent Fourier series

(1) $$f(x_1, \ldots, x_s) = \sum C(m_1, \ldots, m_s) e^{2\pi i \sum m_j s_j}.$$

Theorem: If

(2) $$|C(m_1, \ldots, m_s)| \leqslant \frac{C}{\left[(|m_1|+1)\ldots(|m_s|+1)\right]^\alpha},$$

then for every choice of the optimum coefficients $a_1, a_2, \ldots$ and $\xi_\nu(k) = \left\{\frac{ka_\nu}{p}\right\}$, $\nu = 1, 2, \ldots, s$ it holds the estimation

$$\int_0^1 \ldots \int_0^1 f(x_1, \ldots, x_s) dx_1 \ldots dx_s - \frac{1}{p} \sum_{k=1}^{p} f\left[\xi_1(k), \ldots, \xi_s(k)\right] = O\left(\frac{1}{p^{\alpha-\varepsilon}}\right).$$

Theorem: To every $\alpha > 1$ there exists a function $f(x_1, \ldots, x_s)$, the Fourier coefficients of which satisfy (2) and for which it holds:

$$\left|\int_0^1 \ldots \int_0^1 f dx - \frac{1}{p} \sum f\left[\xi(k)\right]\right| > \frac{1}{p^\alpha}, \quad dx = dx_1 dx_2 \ldots dx_s \quad \text{etc.}$$

Card 2/3

for all $a_1, a_2, \ldots$.

There are 2 references, 1 of which is Soviet, and 1 American.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova AN SSSR (Mathematical Institute imeni V.A.Steklov AS USSR)

PRESENTED: November 21, 1958, by I.M.Vinogradov, Academician

SUBMITTED: November 19, 1958

16(1)

AUTHOR: ~~Korobov, N.M.~~ SOV/20-125-6-4-/61

TITLE: On Partially Rational Trigonometric Sums (O chastichno ratsional'nykh trigonometricheskikh summakh)

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 125, Nr 6, pp 1193 - 1195 (USSR)

ABSTRACT: Let a part of the coefficients of

$f(x) = \alpha_1 x + \dots + \alpha_{n+1} x^{n+1}$ be rational. Let $q$ be the least common multiple of these coefficients. Then

$$\sum_{P<x\leqslant P+q} \exp\left[2\pi i f(x)\right],$$ P arbitrarily integer, is called partially rational trigonometric sum.

Theorem : If $q$ is prime, $1 \leqslant s < n < q - 1$ and $(q, a_{n+1}) = 1$ then for arbitrary real $\alpha_1, \dots, \alpha_s$ for

Card 1/3

$$S = \sum_{P<x\leqslant P+q} \exp\left[2\pi i\left(\alpha_1 x + \ldots + \alpha_s x^s + \frac{a_{s+1}x^{s+1} + \ldots + a_{n+1}x^{n+1}}{q}\right)\right]$$

there holds the estimation

$$|S| \leqslant e^{B\left(\frac{\ln n}{s^2 \ln 2s} + s\ln^2 2s\right)} q^{1 - \frac{\gamma}{s^2 \ln 2s}},$$

where $B > 0$, $\gamma > 0$ are absolute constants.
Theorem : Let $1 \leqslant s < n < q$ and $(q, (n+1)!\, a_{n+1}) = 1$.
Then it is

$$S = O\left(q^{1 - \frac{\gamma}{ns^2 \ln 2s}}\right),$$

where $\gamma$ is an absolute positive constant.

Card 2/3

For the proof the author uses results of A. Weil [Ref 2], On Partially Rational Trigonometric Sums SOV/20-125-6-4/61

I.M. Vinogradov [Ref 3,4] and Yu.V. Linnik [Ref 5]. There are 7 references, 5 of which are Soviet, and 2 American.

ASSOCIATION: Matematicheskiy institut imeni V.A. Steklova AN SSSR (Mathematical Institute imeni V.A. Steklov AS USSR)

PRESENTED: September 1, 1958, by I.M. Vinogradov, Academician

SUBMITTED: June 26, 1958

Card 3/3

16(1)

AUTHOR: Korobov, N.M. SOV/20-128-2-4/59

TITLE: Approximate Solution of Integral Equations

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 128, Nr 2, pp 235-238 (USSR)

ABSTRACT: Let $\alpha > 1$, $\bar{m} = \max(1, |m|)$, $s \geqslant 1$ and $E_s(\alpha)$ be the class of functions

$$(1)\quad F(x_1,\dots,x_s) = \sum_{m_1,\dots,m_s=-\infty}^{\infty} C(m_1,\dots,m_s) e^{2\pi i(m_1x_1+\dots+m_sx_s)}$$

$$C(m_1,\dots,m_s) = O((\bar{m}_1\dots\bar{m}_s)^{-\alpha}).$$

The author considers the Fredholm equation of second kind

$$(2')\quad \varphi(P) = \lambda \int_{G_s} K(P,Q)\varphi(Q)dQ + f(P),$$

where $f \in E_s(\alpha)$, $K \in E_{2s}(\alpha)$, $G_s$ is the s-dimensional unit cube and the Fredholm denominator is $D(\lambda) \neq 0$.

Theorem 1: Let $\varphi(P)$ be a solution of (2'). Let $M_i = M[\xi_1(i),\dots,\xi_s(i)]$, where $\xi_1(i) = \left\{\frac{i}{p}\right\}$, $\xi_2(i) = \left\{\frac{i^2}{p}\right\}$, ..., $\xi_s(i) = \left\{\frac{i^s}{p}\right\}$, where $\{a\}$

Card 1/2

denotes the fractional part of a. Then $\varphi(M_i) = \tilde{\varphi}(M_i) + O\left(\frac{1}{\sqrt{N}}\right)$, where the magnitudes $\tilde{\varphi}(M_i)$ satisfy the linear algebraic system

$$(3)\quad \tilde{\varphi}(M_j) = \frac{\lambda}{N}\sum_{i=1}^{N} K(M_j, M_i)\,\tilde{\varphi}(M_i) + f(M_j), \qquad j = 1, 2, \ldots, N.$$

Theorem 2: Let $\varphi(P)$ be a solution of (2'). If $M_i = M\left(\left\{\frac{ia_1}{p}\right\}, \ldots, \left\{\frac{ia_s}{p}\right\}\right)$, then $\varphi(P) = \frac{1}{N}\sum_{i=1}^{N} K(P, M_i)\,\tilde{\varphi}(M_i) + f(P) + O(N^{-\alpha}\ln^{as}N)$, where $\tilde{\varphi}(M_i)$ satisfy the system (3).

Theorem 3 shows that for an unessential deterioration of the order of estimation of theorem 1 and for small $\lambda$ the calculation of $\varphi(P)$ is possible even without a transition to the linear system of equations (3). The author thanks A.V.Bitsadze. There are 4 Soviet references.

ASSOCIATION: Matematicheskiy institut imeni V.A.Steklova Akademii nauk SSSR (Institute of Mathematics imeni V.A.Steklov, AS USSR)

PRESENTED: May 18, 1959, by S.L.Sobolev, Academician

SUBMITTED: May 11, 1959

Card 2/2

16.4100

81694

S/020/60/132/05/10/069

AUTHOR: Korobov, N. M.

TITLE: Properties and Calculation of Optimal Coefficients

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 132, No. 5, pp. 1009-1012

TEXT: The function

$$(1) \qquad f(x_1, \ldots, x_s) = \sum_{m_1, \ldots, m_s = -\infty}^{\infty} C(m_1, \ldots, m_s) e^{2\pi i (m_1 x_1 + \ldots + m_s x_s)}$$

is said to belong to the class $E_s^{\alpha}$, if $c(m_1, \ldots, m_s) = 0\,((\overline{m}_1, \ldots \overline{m}_s)^{-\alpha})$, where $\alpha > 1$ and where it denotes $\overline{m}_\nu = \max(1, |m_\nu|)$. The integers $a_\nu = a_\nu(p)$ ($\nu = 1, 2, \ldots, s$) are denoted as optimal coefficients (Ref. 1,2), if for $f \in E_s^{\alpha}$ the remainder R in the quadrature formula

$$(2) \qquad \int_0^1 \cdots \int_0^1 f(x_1, \ldots, x_s)\, dx_1 \ldots dx_s = \frac{1}{p} \sum_{k=1}^{p} f\left(\frac{ka_1}{p}, \ldots, \frac{ka_s}{p}\right) - R$$

Card 1/3

81694
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Properties and Calculation of Optimal Coefficients

admits the estimation $R = O(p^{\alpha} \ln^{\beta} p)$, where $\beta$ does not depend on p. Let z be integer, $p > s$ prime; $[A]$ - integer, $\{A\}$ - fractional part of the number A. Let

$$(3) \quad H(z) = \frac{3^s}{p} \sum_{k=1}^{p} \left(1 - 2\left\{\frac{k}{p}\right\}\right)^2 \cdots \left(1 - 2\left\{\frac{kz^{s-1}}{p}\right\}\right)^2.$$

Theorem 1: If the minimum of the function H(z) on the interval $1 \leq z < p$ is attained for $z = a$, then the integers $1, a, \ldots, a^{s-1}$ are the optimum coefficients for the classes $E_s^{\alpha}$, for which $\alpha \geq 2$.

Theorem 2 contains a somewhat sharper statement.

Theorem 3: Let $(a_\nu, p) = 1$ and $a_\nu b_\nu \equiv 1 \pmod p$, $\nu = 1, 2, \ldots, s$. In order that $a_1, \ldots, a_s$ be optimum coefficients it is necessary and sufficient that the inequalities

Card 2/3



81694
S/020/60/132/05/10/069

Properties and Calculation of Optimal Coefficients

$$(10) \quad \left| \frac{b_{\nu-1} a_\nu}{p} m_\nu + \cdots + \frac{b_{\nu-1} a_s}{p} m_s - n \right| > \frac{B}{\overline{m_\nu} \cdots \overline{m_s} \ln^{\nu} p}$$

$$(\nu = 2, 3, \ldots, s)$$

are satisfied for all integer $n, m_\nu, \ldots, m_s$ which satisfy the condition $a_\nu m_\nu + \ldots + a_s m_s \not\equiv 0 \pmod p$, where $B = B(s) > 0$ and $\nu = \nu(s) \geq 0$.

There are 3 Soviet references.

ASSOCIATION: Matematicheskiy institut imeni V. A. Steklova Akademii nauk SSSR (Mathematical Institute imeni V. A. Steklov AS USSR)

PRESENTED: February 5, 1960, by J. M. Vinogradov, Academician

SUBMITTED: February 4, 1960

Card 3/3

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S/020/60/133/005/023/034XX
C111/C222

16,1000

AUTHOR: Korobov, N.M.

16

TITLE: Estimates of Trigonometric Sums With Quite Uniformly Distributed Functions

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 133, No. 5, pp. 1011-1014.

TEXT: f(x) is called quite uniformly distributed (Ref. 1) if for every $s \geqslant 1$ and for arbitrary integral $m_1, \ldots, m_s$ (not simultaneously equalling zero) it holds

$$(1) \qquad \sum_{x=1}^{P} e^{2\pi i F_s(x)} = o(P),$$

where

$$(2) \qquad F_s(x) = m_1 f(x+1) + \ldots + m_s f(x+s).$$

Let $p_k$ be prime numbers, $(2k+1)^k < p_k < 2(k+1)^k$, $k=1,2,\ldots$. There exist integers $a_{k,\nu}$ $(\nu = 1,2,\ldots,k)$ so that the congruence $a_{k,1}x_1 + \ldots + a_{k,k}x_k \equiv 0 \pmod{p_k}$ for $|x| \leqslant k$ admits only the trivial solution. Let $\psi(k) > k^2$ be an arbitrary integral function, $\tau_0 = 0$ and $\tau_k = \tau_{k-1} + k\psi(k)p_k$. Every

Card 1/2



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integer $x \geqslant 1$ admits a unique representation $x = \tau_{k-1} + ky + z$, where $k \geqslant 1$, $0 \leqslant y \leqslant \psi(k)p_k - 1$ and $1 \leqslant z \leqslant k$.

Theorem 1: The fractional parts of each function f(x) which is defined by the equations $x = \tau_{k-1} + ky + z$, $f(x) = \frac{a_{k,z}}{p_k} y$, are quite uniformly distributed.

Theorem 2: To every monotone function $\varphi(P)$ which tends to infinity arbitrarily slow for $P \to \infty$, there exists a quite uniformly distributed function f(x) with the property that

$$S = \sum_{x=1}^{P} e^{2\pi i F_s(x)} = O(\varphi(P)).$$

This estimation cannot be improved for any quite uniformly distributed function up to O(1).

The proofs of the theorems base on (Ref. 3,4). There are 4 Soviet references.

ASSOCIATION: Matematicheskiy institut im. V.A. Steklova Akademii nauk SSSR (Mathematical Institute im. V.A. Steklov AS USSR)

PRESENTED: April 5, 1960, by I.M. Vinogradov, Academician.
SUBMITTED: March 30, 1960

Card 2/2

16.4500

29899
S/517/61/060/000/005/009
B112/B125

AUTHOR: Korobov, N. M.

TITLE: Application of number-theoretical nets to integral equations and interpolation formulas

SOURCE: Akademiya nauk SSSR. Matematicheskiy institut. Trudy. v. 60, 1961, 195 - 210

TEXT: In the first section of this paper, the author derives an integral formula

$$\int_0^1 \dots \int_0^1 f(x_1, \dots, x_s) dx_1 \dots dx_s = \frac{1}{N} \sum_{k=1}^{N} f\left(\left\{\frac{ka_1}{N}\right\}, \dots, \left\{\frac{ka_s}{N}\right\}\right) - R,$$

4

where $\{x\}$ is the number-theoretical function $x - [x]$. In the second section, the integral equation $\varphi(P) = \lambda \int K(P,Q)\varphi(Q)dQ + f(P)$ is solved by a function having the form

$$\varphi(P) = f(P) + \frac{1}{N} \sum_{k=1}^{N} \sum_{\nu=1}^{n} \lambda^{\nu} K(P, M_{1,k}) \dots K(M_{\nu-1,k}, M_{\nu,k}) f(M_{\nu,k}) + O\left(\frac{1}{N^{\alpha-\varepsilon}}\right),$$

Card 1/2

APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000824810003-5

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B112/B125

Application of number-theoretical ...

where $M_{\nu,k} = \left(\left\{\frac{ka^{r(\nu-1)}}{N}\right\}, \dots, \left\{\frac{ka^{r\nu-1}}{N}\right\}\right)$. In the third and final section, the author derives an interpolation formula

$$f(x_1, \dots, x_s) = \int_0^1 \dots \int_0^1 \sum_{\tau_1, \dots, \tau_s = 0}^{1} f^{\tau_1 \nu \dots \tau_s \nu} (y_1, \dots, y_s) \varphi_{\nu}^{\tau_1} (y_1 - x_1) \dots$$

$$\dots \varphi_{\nu}^{\tau_s} (y_s - x_s) dy_1 \dots dy_s \quad (\nu \leqslant r).$$

4

There are 11 Soviet references.

Card 2/2

S/794/62/000/001/003/010

AUTHOR: Korobov, N. M.

TITLE: On the application of number-theoretic networks.

SOURCE: Vychislitel'nyye metody i programmirovaniye; sbornik rabot Vychislitel'nogo tsentra Moskovskogo universiteta. no.1. Ed. by N. P. Trifonov, G. S. Roslyakov, and Ye. A. Zhogolev. [Moscow] Izd-vo Mosk. un-ta, 1962, 80-102.

TEXT: The paper sets forth in detail some of the problems mentioned briefly in the survey paper presented by the author in 1959 at the All-Union Conference on Computational Mathematics and Computational Engineering at the Moscow State University. The objective of the paper is to facilitate the practical application of one of the number-theoretic methods for the approximate calculation of multiple integrals, namely, the method of optimal coefficients. 1. Integration of periodic functions. The use of uniform networks and of quadrature formulas exhibits the shortcoming of a rapid decrease in accuracy with an increase in the number of measurements. The use of number-theoretic networks permits the removal of the shortcomings of the uniform networks. Parallelepipedal networks only are examined in the present paper. The concept of optimal coefficients is set forth and defined,

Card 1/2

and their actual existence is demonstrated. The method for the finding of the optimal coefficients shown here is to be applied in multiple integrals of an $S \geq 3$. Reference is made to a simpler method for S=2. 2. Integration of nonperiodic functions. Upon periodization of such a function, optimal coefficients are found again, and it is noted that the method of optimal coefficients can be employed even in those cases in which the integration interval is at variance with the unit cube. If the integration interval has a reasonably smooth boundary, then it may be transformed into a unit cube with subsequent periodization of the problem. The results obtained in this paper, obviously, confirm the superiority of the method of optimal coefficients over other methods for the evaluation of multiple integrals of functions that pertain to the classes $E_s^\alpha$ and $H_s^\alpha$. There are 8 Russian-language Soviet references.

KOROBOV, Nikolay Mikhaylovich; RYABEN'KIY, V.S., red.; KRYUCHKOVA, V.N., ~~tekhn. red.~~

[Number-theoretical methods in approximation analysis] Teoretikochislovye metody v priblizhennom analize. Moskva, Fizmatgiz, 1963. 224 p. (MIRA 16:11)
(Mathematical analysis)

KARATSUBA, A.A.; KOROBOV, N.M.

Theorem of the mean. Dokl. AN SSSR 149 no.2:245-248 Mr '63.
(MIRA 16:3)

1. Predstavleno akademikom A.N.Kolmogorovym.
(Linear equations)

L 09200-67 EWT(d) IJP(c)
ACC NR: AP7002784 SOURCE CODE: UR/0055/66/000/004/0042/0046

12
B

AUTHOR: Korobov, N. M.

ORG: Department of the Theory of Numbers, Moscow State University (Kafedra teorii chisel, Moskovskiy gosudarstvennyy universitet)

16

TITLE: Distribution of fractional parts of exponential functions

SOURCE: Moscow. Universitet. Vestnik. Seriya I. Matematika, mekhanika, no. 4, 1966, 42-46

TOPIC TAGS: function, mathematics

ABSTRACT: Let Npl(y) be the number of solutions of the inequality

$$0 < \{\alpha q^x\} < y \quad (x = 1, 2, \ldots, P).$$

A set of numbers $\alpha$ and $q$ is given for which the following relation holds:

$$N_p(y) = yP + O(\sqrt[3]{P}\ \ln^{4} P).$$

Orig. art. has: 11 formulas. [JPRS: 38,006]

SUB CODE: 12 / SUBM DATE: 10Oct64 / ORIG REF: 004 / OTH REF: 001

Card 1/1 UDC: 517.562

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L 36980-66 EWP(k)/EWT(d)/EWP(h)/EWP(l)/EWP(v) BC
ACC NR: AP6008527 SOURCE CODE: UR/0280/66/000/001/0118/0123



53
B

AUTHOR: Korobov, N. N. (Khar'kov)

ORG: none

TITLE: Estimates of efficiencies of automatic control systems with input signal adaption

SOURCE: AN SSSR. Izvestiya. Tekhnicheskaya kibernetika, no. 1, 1966, 118-123

TOPIC TAGS: automatic control theory, circuit design, self adaptive control

ABSTRACT: The introduction of adaptive features into control systems using a posteriori information is based on expectations that the quality of operations is improved. To test this premise, the author investigates the efficiency of the application of adaptation according to input signals by introducing the space input signals, studying the optimum characteristics of basic control loops, estimating the stability of adaptive systems, and estimating the adaptation efficiency during discrete parameter switching. Concepts of the efficiency of real and ideal adaptive systems are introduced. These concepts make it possible to estimate the adaptation gain and stability, and to outline ways to determine adaptive loop parameters. The discussion is illustrated by the determination of the parameters of the basic loop of the system shown in Fig. 1 and the estimate of its adaptive

Card 1/2

L 07204-67 EWT(d)/EWP(v)/EWP(k)/EWP(h)/EWP(1) GD

ACC NR: AT6022700 SOURCE CODE: UR/0000/66/000/000/0344/0353

44
B+1

AUTHOR: Korobov, N. N.

ORG: none

TITLE: Automatic control systems with self adjustment according to input signal

SOURCE: Moscow. Institut avtomatiki i telemekhaniki. Samoobuchayushchiyesya avtomaticheskiye sistemy (Self-instructing automatic systems). Moscow, Izd-vo Nauka, 1966, 344-353

TOPIC TAGS: automatic control parameter, optimal automatic control, self adaptive control, automatic control theory

ABSTRACT: This paper examines several results of studying systems which adapt to change in characteristics of an input signal. The optimum self-adjusting system must be synthesized in accordance with the criterion of minimum conditional risk. One class of systems is studied which recognizes an input system by observing the characteristics of vector Q in the space of the system input signals. The investigation made of the dynamics of a simplified system leads to the conclusion that systems may be constructed which adjust themselves according to the input signal and have fewer losses than systems with fixed parameters. Constant automatic parameter control systems synthesized by the criterion of minimum average risk may, during operation with input signal characteristics deviating from average values, have quality indexes whi

Card 1/2

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are not optimum; hence in these cases systems are desirable which adapt to change in input signal characteristics. The author considers the problem of synthesizing an optimum linear system at whose input arrives signal x(t), and additive mixture of useful [s(t)] and noise [n(t)] signals, i.e., x(t) = s(t) + n(t). Topics covered are geometric treatment of self-adjustment process, comparison of losses in nonadapting and non-self-adjusting systems, methods of computing the vector and adaptation of systems to input signal systems with continuous amplification factor, law of change of this factor in self-adjustment, and motion equation, stability, and transients of the self-adjusting system. Orig. art. has: 47 formulas and 8 figures.

SUB CODE: 09/ SUBM DATE: 02Mar66/ ORIG REF: 005/ OTH REF: 002

Card 2/2 11b

KOROBOV, N. N. (Khar'kov)

Synthesis of optimum characteristics of pulse-type tracking systems. Avtom. i telem. 23 no.9:1215-1223 S '62.
(MIRA 15:10)

(Automatic control)

ACCESSION NR: AP4043470 S/01°;/64/025/008/1182/1190

AUTHOR: Korobov, N. N. (Khar'kov)

TITLE: Input-adaptive sampled-data servo system

SOURCE: Avtomatika i telemekhanika, v. 25, no. 8, 1964, 1182-1190

TOPIC TAGS: automatic control, adaptive automatic control, sampled data automatic control, input adaptive automatic control

ABSTRACT: The simplest class of input-adaptive sampled-data systems, with a desirable input signal mixed with additive noise, is theoretically considered. It is assumed that both the signal and the noise slowly vary in the course of the follow-up process. A form of the loss function is determined. Parameters of the input-signal distribution which need evaluation in the adaptive process are specified. The adaptation process is considered in a simple example of a system consisting of a key, a measuring device, a fixing device, and an integrator (the continuous



APPROVED FOR RELEASE: 06/14/2000 CIA-RDP86-00513R000824810003-5

ACCESSION NR: AP4043470

part). The principle of calculating and setting optimum parameters is formulated. The simplest method of adaptation presupposes that the entire space of possible values Q is quantized into two nonintersecting subspaces $Q_1$ and $Q_2$ divided by a boundary; the system chooses between only two amplification factors; the threshold value of the input signal is so established that the average risk of incorrect adaptation is at a minimum. Orig. art. has: 6 figures and 40 formulas.

ASSOCIATION: none

SUBMITTED: 11Mar63 ATD PRESS: 3078 ENCL: 00

SUB CODE: DP, IE NO REF SOV: 003 OTHER: 001

ACCESSION NR: AP4043470 S/0103/64/025/008/1182/1190

AUTHOR: Korobov, N. N. (Khar'kov)

TITLE: Input-adaptive sampled-data servo system

SOURCE: Avtomatika i telemekhanika, v. 25, no. 8, 1964, 1182-1190

TOPIC TAGS: automatic control, adaptive automatic control, sampled data automatic control, input adaptive automatic control

ABSTRACT: The simplest class of input-adaptive sampled-data systems, with a desirable input signal mixed with additive noise, is theoretically considered. It is assumed that both the signal and the noise slowly vary in the course of the follow-up process. A form of the loss function is determined. Parameters of the input-signal distribution which need evaluation in the adaptive process are specified. The adaptation process is considered in a simple example of a system consisting of a key, a measuring device, a fixing device, and an integrator (the continuous

ACC NR: AP6036440 SOURCE CODE: UR/0370/66/000/006/0097/0100

AUTHORS: Lokshin, F. L. (Moscow); Vaynblat, Yu. M. (Moscow); Korobov, O. S. (Moscow) Shakhanova, G. V. (Moscow)

ORG: none

TITLE: Investigation of the decomposition kinetics of a supersaturated solid solution in alloy D-16

SOURCE: AN SSSR. Izvestiya. Metally, no. 6, 1966, 97-100

TOPIC TAGS: aluminum alloy, electric resistance, thermal stability / D-16 aluminum alloy

ABSTRACT: The decomposition kinetics of the supersaturated solid solution in alloy D-16 (4.0% Cu, 1.35 % Mg, and 0.5% Mn) was investigated. The investigation supplements the results of K. S. Kirpichnikov and V. I. Kulakov (Osobennosti stareniya splava D-16. Termicheskaya obrabotka i svoystva splavov. Tr. MATI, 1962, No. 55, 133). The decomposition kinetics was studied by determining the change in the electrical resistance of the specimens as a function of time and temperature. The experimental procedure followed is described by M. A. Shtremel', I. N. Kidin, and A. V. Panov (Zavodskaya laboratoriya, 1960, No. 8, 1009). The experimental results are presented graphically (see Fig. 1). It was found that the changes in the hardness, strength limit, and creep in alloy D-16 occur at later stages in the decomposition

UDC: 669.715

Card 1/2

curves ...

Orig. art. has: 5 graphs.

SUB CODE: 11/20/ SUBM DATE: 05Apr65/ ORIG REF: 004



Card 2/2

L 3159-66 EWT(m)/EWP(w)/T/EWP(t)/EWP(b) JD

ACCESSION NR: AP5008788 S/0126/65/019/003/0418/0423
532.72+539.5 30
B

AUTHOR: Vaynblat, Yu. M.; Korobov, O. S.

TITLE: The nature of fan crystallization in continous casting of ingots of ATsM alloy

SOURCE: Fizika metallov i metallovedeniya, v. 19, no. 3, 1965, 418-423

TOPIC TAGS: aluminum alloy, fan crystallization, continuous casting

ABSTRACT: The fan-type structure which appears during continuous casting of aluminum alloys reduces the ductility of the material in pressure working and causes cracks to appear during forging and rolling. V. I. Dobatkin ("Aluminum Alloy Ingots," Moscow, *Metallurgizdat*, 1960), who was the first to detect fan crystallization in continuously cast ingots, found that the fan structure is a variation of the columnar structure and forms at locations where the overheated melt comes in contact with a crystallization surface. A necessary condition for the appearance of a fan structure is a large temperature gradient in the liquid phase. A. A. Popov ("Phase Transformations in Metals and Alloys," Moscow, *Metallurgizdat*, 1963, p 110) discovered

Card 1/2

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that fan crystals are lamellar dendrites, the branches of which grow along axes <110> and <123>. In this work it was found that the lamellar branches of fan crystals have a twin structure and develop primarily along axis <110>. Twin crystals with elements $K_1=(111)$; $\eta_1=[11\bar{2}]$ form during side growth of the lamellar branches of the dendrites. It is shown that during continuous casting the fan crystals grow vertically upward, forming a region with a predominant <110> orientation. Orig. art. has: 7 figures.

ASSOCIATION: none

SUBMITTED: 13Apr64 ENCL: 00 SUB CODE: MM

NO REF SOV: 009 OTHER: 001

Card 2/2 mk

KOROBOV, P.

Tillage

System of cultivating soil in the fall. Kolkh. proizv. 12, no. 8, 1952.

Monthly List of Russian Accessions, Library of Congress, November 1952. UNCLASSIFIED.

1. KOROBOV, P.

2. USSR (600)

4. Tillage

7. Ways to further increase productivity on southeastern collective farms, Kolkh. proizv., 13, No. 2, 1953.

9. **Monthly List of Russian Accessions**, Library of Congress, May 1953. Unclassified.

KOROBOV, P.

Construction of apparatuses for the automatization of underground transportation, reply from Gostekhnika SSSR. Gor. zhur. no.2:53 F '57. (MLRA 10:4)

1. Zamestitel' predsedatelya Gostekhniki SSSR.
(Mine railroads) (Automatic control)

KOROBOV, P.

BARDIN, I.; BELAN, R.; BEKHTIN, N.; BOYKO, V.; BORISOV, A.; BYCHKOV, V.; VASILENKO, S.; VINOGRADOV, V.; VISHNEVSKIY, A.; VODNEV, G.; DVORIN, S.; DZHAPARIDZE, Ye.; DIDENKO, V.; D'YAKONOV, N.; ZHURAVLEV, S.; ZAKHAROV, A.; IVANOV, I.; KIRSANOV, M.; KOLYADA, G.; KOROBOV, P.; LESKOV, A.; LUKICH, L.; LYUBIMOV, A.; MELESHKIN, S.; MYRTSYMOV, A.; PERTSEV, M.; PETRUSHA, F.; PITERSKIY, A.; POPOV, I.; RAYZER, D.; ROZHKOV, A.; SAPOZHNIKOV, L.; SEDOV, P.; SOKOLOV, P.; TEVOSYAN, I.; TIKHONOV, N.; TISHCHENKO, S.; FILIPPOV, B.; FOMENKO, N.; SHELKOV, A.; SHEREMET'YEV, A.

Fedor Aleksandrovich Merkulov. Koks i khim.no.7:63 '56. (MLRA 9:12)
(Merkulov, Fedor Aleksandrovich, 1900-1956)

Korobov, P.D.

KERNER, Mendel' Saulovich; KOROBOV, P.D., otvetstvennyy red.; KUSKOVA, A.I., red.; SHISHKOVA, L.M., tekhn. red.

[Use of new technological processes in welding] Primenenie novykh tekhnologicheskikh protsessov svarki. Leningrad, Gos. soiuznoe izd-vo sudostroit. promyshl., 1958. 132 p. (MIRA 11:8)
(Electric welding)

KOROBOV, P.D., inzh.; KERNER, M.S., inzh.

Manufacturing welded superstructures using aluminum-magnesium alloys. Sudostroenie 25 no.5:47-53 My '59.
(MIRA 12:8)

(Ships--Welding) (Aluminum-magnesium alloys)

RUSSO, Vladimir Leonidovich; ~~KOROBOV, P.D.,~~ inzh., retsenzent; RAZDUY, F.I., kand. tekhn. nauk, retsenzent; ALSUF'YEV, P.A., nauchnyy red.; SHAKHNOVA, V.M., red.; KOROVENKO, Yu.N., tekhn. red.

[Welding aluminum alloys in an inert gas atmosphere] Svarka aliuminievykh splavov v srede inertnykh gazov. Leningrad, Sudpromgiz, 1962. 160 p. (MIRA 15:8)
(Aluminum alloys—Welding)
(Protective atmospheres)

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S/125/62/000/007/002/012
D040/D113

1.2300 (2408)

AUTHORS: Bel'chuk, G.A., Petrushin, I.V., Korobov, P.D., and Sidorov, A.D.

TITLE: Corrosion resistance of welded joints between aluminum alloys and steel

PERIODICAL: Avtomaticheskaya svarka, no. 7, 1962, 8-11

TEXT: Results are given of corrosion tests conducted with argon arc welded joints of aluminum alloys and steel, which were produced in experiments by the Leningradskiy korablestroitel'nyy institut (Leningrad Shipbuilding Institute) -LKI, jointly with the Leningradskiy zavod im. A.A. Zhdanova (Leningrad Plant im. A.A. Zhdanov). The welding techniques were previously described by Bel'chuk ("Svarochnoye proizvodstvo", no. 5, 1961). The strength of welds obtained using these techniques equalled the strength of pure aluminum. The test specimens were prepared by butt-and T-welding AMr6 (AMg6) alloy to zinc-coated low-carbon steel. The corrosion tests, lasting 4,300 hours, were conducted using a Gardner's wheel and a humid-chamber containing a mixture of synthetic sea water and air injected every 30 min. The corrosion résistance was judged according to appearance and mechanical strength tests. No traces of corrosion were revealed in welds; however, the aluminum alloy and steel were affected. The protective effect of ФЛ-03

Card 1/2



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Corrosion resistance .......

(FL-03), АЛГ-1 (ALG-1) and АЛГ-5 (ALG-5) priming paints was also tested, and the FL-03 grade found to be the best. Several experimental structures were welded from standard elements at the Plant imeni Zhdanov, using new argon arc welding techniques, and the following recommendations are made: up to 0.5 m butt welds should be welded directly, without changing the butt faces, but the aluminum element should be flanged if the butt joints are 1 m long or longer, since this makes the alignment easier. Besides, flanging is good for thin metal (thinner than 3 mm), since it prevents the zinc from burning too quickly on the opposite steel element. Conclusions: (1) The corrosion resistance of composite welded structures of aluminum alloy and zinc-coated steel in sea water is sufficient; (2) the new welding technology is suitable forlightweight shielding structures, for joining such structures to steel coamings, for fabricating aluminum alloy cabinets with steel frames, etc. There is 1 figure and 2 tables.

ASSOCIATION: Leningradskiy korablestroitel'nyy institut (Leningrad Shipbuilding Institute) (G.A. Bel'chuk and I.V. Petrushin); Leningradskiy zavod im. A.A. Zhdanova (Leningrad Plant im. A.A. Zhdanov) (P.D. Korobov and A.D. Sidorov)

SUBMITTED: November 9, 1961

Card 2/2

KOROBOV, P.D.

"Organization of welding procedures" by Z.B.Dreizenshtok. Reviewed by P.D.Korobov. Avtom.svar. 15 no.4:92 Ap '62. (MIRA 15:3)
(Welding) (Dreizenshtok, Z.B.)

BEL'CHUK. G.A.; PETRUSHIN, I.V.; KOROBOV, P.D.; SIDOROV, A.D.

Corroison resistance of welded joints in aluminum alloys and steel. Avtom. svar. 15 no.7:8-11 Jl '62. (MIRA 15:7)

1. Leningradskiy korablestroitel'nyy institut (for Bel'chuk, Petrushin).
2. Leningradskiy zavod imeni A.A.Zhdanova (for Korobov, Sidorov).
(Aluminum alloys--Welding) (Steel--Welding)
(Corrosion and anticorrosives)

RYTOV, Yuriy Aleksandrovich; KOROBOV, P.I., red.; AVDEYEVA, V.A., tekhn. red.

[Man at automatic machines] Chelovek u avtomatov. Moskva, Sovetskaia Rossiia, 1962. 162 p. (MIRA 15:7)
(Automation)

KOROBOV, P.I.; KHLEBNIKOV, V.B.; BOLDBOV, A.F.; SKOCHINSKIY, A.A.; SHEVYAKOV, L.D.; MEL'NIKOV, N.V.; MELESHKIN, P.M.; MOSKAL'KOV, Ye.F.; POKROVSKIY, M.A.; KAPLUNOV, R.P.; BOGOLYUBOV, B.P.; ARUTYUNOV, N.B.; BOYKO, V.Ye.; BRENZA, N.M.; FEDOROV, V.F.; AGOSHKOV, M.I.; BARONSHIKOV, A.V.; VORONIN, L.N.; IPATOV, P.M.; NAZAROV, P.P.; SLUTSKAYA, O.M.; CHERNENKO, N.B.; RABINOVICH, V.I.; SHELEVSKIY, V.N.; TROITSKIY, A.V.; GOL'DIN, Ya.A.; DZHAPARIDZE, Yo.A.; ZHURAVLEV, S.P.; KUZNETSOV, K.K.; MALEVICH, N.A.; MARINENKO, M.P.; MARTYNOV, G.P.; NATAROV, P.F.; PERTSEV, M.A.; ROSSMIT, A.F.; RYASHOY A.A.; SOSEDOV, O.O.; VINOGRADOV, V.S.; ZUBAREV, S.N.; SHAFARENKO, I.P.

Nikolai Nikolaevich Patrikeev; an obituary. Gor.zhur. no.6:76 Je '60. (MIRA 14:2)

(Patrikeev, Nikolai Nikolaevich, 1890-1960)

KOROBOV, P.I.

Achievements in blast furnace production in the U.S.S.R. during 45 years of Soviet government. Stal' 22 no.11:965-968 N '62.
(MIRA 15:11)

(Blast furnace)

LUBAN, Leonid Leont'yevich; KOROBOV, P.I., red.; MEDVEDEVA, R.A., tekhn. red.

[Miracles enter life] Chudesa vkhodiat v zhizn'. Moskva, Sovetskaia Rossiia, 1963. 193 p. (MIRA 16:9)
(Synthetic products)

PETROV, Petr Sergeyevich, kand. ekon. nauk; KOROBOV, P.I., red.; MARAKASOVA, L.P., tekhn. red.

[The sprouts of communism]Rostki kommunizma. Moskva, Sovetskaia Rossiia, 1962. 86 p. (MIRA 15:10)
(Efficiency, Industrial)

KOROBOV, P.I., red.; KHAR'KOV, S.F., tekhn. red.

[Put the resouces of the land in the service of our country]
Bogatstva zemli - na sluzhbu Rodine; materialy. Moskva, Izd-vo "Sovetskaia Rossiia," 1962. 159 p. (MIRA 15:2)

1. Soveshchaniye rabotnikov sel'skogo khozyaystva oblastey TSentral'noy chernozemnoy zony, Voronezh, 1962.
(Central Black Earth Region--Agriculture)